

CLAIMS

1. A shelf for use among a plurality of shelves in a rack for use in a telecommunications system for providing both narrowband and broadband services to a plurality of subscriber premises, comprising:

5 a housing for connection to a narrowband network and for connection to a broadband network for connecting said narrowband network and said broadband network to said plurality of subscriber premises via a corresponding plurality of twisted copper pairs, wherein said housing includes plural sections including:

10 an upper section (22) for housing in a central portion (24) thereof a plurality of lowpass filter cards with connectors thereon for insertion in a backplane of said housing, and wherein said upper portion (22) of said housing also has end portions (33) reserved for connecting said narrowband network and said plurality of twisted copper pairs; and

15 20 a lower section (20) for housing a plurality of line termination cards in a central portion (14) thereof, each with connectors thereon for insertion in said backplane of said housing, and wherein said lower section (20) includes at least one end portion (35) reserved for at least one network termination card for said connection to said broadband network.

25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 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7235 7240 7245 7250 7255 7260 7265 7270 7275 7280 7285 7290 7295 7300 7305 7310 7315 7320 7325 7330 7335 7340 7345 7350 7355 7360 7365 7370 7375 7380 7385 7390 7395 7400 7405 7410 7415 7420 7425 7430 7435 7440 7445 7450 7455 7460 7465 7470 7475 7480 7485 7490 7495 7500 7505 7510 7515 7520 7525 7530 7535 7540 7545 7550 7555 7560 7565 7570 7575 7580 7585 7590 7595 7600 7605 7610 7615 7620 7625 7630 7635 7640 7645 7650 7655 7660 7665 7670 7675 7680 7685 7690 7695 7700 7705 7710 7715 7720 7725 7730 7735 7740 7745 7750 7755 7760 7765 7770 7775 7780 7785 7790 7795 7800 7805 7810 7815 7820 7825 7830 7835 7840 7845 7850 7855 7860 7865 7870 7875 7880 7885 7890 7895 7900 7905 7910 7915 7920 7925 7930 7935 7940 7945 7950 7955 7960 7965 7970 7975 7980 7985 7990 7995 8000 8005 8010 8015 8020 8025 8030 8035 8040 8045 8050 8055 8060 8065 8070 8075 8080 8085 8090 8095 8100 8105 8110 8115 8120 8125 8130 8135 8140 8145 8150 8155 8160 8165 8170 8175 8180 8185 8190 8195 8200 8205 8210 8215 8220 8225 8230 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5 with connectors thereon for insertion in a backplane of said housing, and wherein said first section (22) of said housing also has end portions (33) reserved for connecting said narrowband network and said plurality of twisted copper pairs; and

10 a second section (20) for housing a plurality of line termination cards in a central portion (14) thereof, each with connectors thereon for insertion in said backplane of said housing, and wherein said second section (20) includes at least one end portion (35) reserved for at least one network termination card for connection to said broadband network.

15 3. A shelf, comprising:

20 a housing for connection to a narrowband network and for connection to a broadband network for connecting said narrowband network and said broadband network to said plurality of subscriber premises via a corresponding plurality of twisted pairs, wherein said housing includes plural sections including:

25 a first section (22) for housing in a central portion (24) thereof a plurality of lowpass filter cards with connectors thereon for insertion in a backplane of said housing, and wherein said first section (22) of said housing also has end portions (33) reserved for connecting said narrowband network and said plurality of twisted copper pairs; and

30 a second section (20) for housing a plurality of line termination cards in a central portion (14) thereof, each with connectors thereon for insertion in said backplane of said housing, and wherein said second section (20) includes at least one end portion (35) reserved for at least one network termination card for connection to said broadband network.

4. The shelf of claim 1, wherein said connection to said broadband network is to an asynchronous transfer mode network.

5 5. The housing of claim 2, wherein said connection to said broadband network is to an asynchronous transfer mode network.

10 6. The shelf of claim 3, wherein said connection to said broadband network is to an asynchronous transfer mode network.

15 7. The shelf of claim 1, further comprising at least one network element processor (16a, 16b).

8. The housing of claim 2, further comprising at least one network element processor (16a, 16b).

15 9. The shelf of claim 3, further comprising at least one network element processor (16a, 16b).

20 10. The shelf of claim 1, further comprising an alarm collection unit (18).

11. The housing of claim 2, further comprising an alarm collection unit (18).

20 12. The shelf of claim 3, further comprising an alarm collection unit (18).

13. The shelf of claim 1, wherein said backplane includes a multiplexer bus with control leads (78).

25 14. The housing of claim 2, wherein said backplane includes a multiplexer bus with control leads (78).

15. The shelf of claim 3, wherein said backplane includes a multiplexer bus with control leads (78).

5 16. The shelf of claim 1, wherein said backplane includes a bus with access granted to said line termination cards according to an access mode requested by said line termination card.

10 17. The housing of claim 2, wherein said backplane includes a bus with access granted to said line termination cards according to an access mode requested by said line termination card.

15 18. The shelf of claim 3, wherein said backplane includes a bus with access granted to said line termination cards according to an access mode requested by said line termination card.

20 19. The shelf of claim 1, wherein access to said backplane by said line termination cards is according to a cell aging priority mechanism as well as a quality of service priority mechanism.

25 20. The housing of claim 2, wherein access to said backplane by said line termination cards is according to a cell aging priority mechanism as well as a quality of service priority mechanism.

25 21. The shelf of claim 3, wherein access to said backplane by said line termination cards is according to a cell aging priority mechanism as well as a quality of service priority mechanism.

22. The shelf of claim 1, wherein said plurality of said lowpass filter cards is equal to twelve lowpass

filter cards and wherein said plurality of line termination cards is equal to twelve line termination cards.

5 23. The shelf of claim 22, wherein each lowpass filter card and each line termination card has four channels, and wherein said plurality of twisted copper pairs is equal to forty-eight.

10 24. The housing of claim 2, wherein said plurality of said lowpass filter cards is equal to twelve lowpass filter cards and wherein said plurality of line

termination cards is equal to twelve line termination cards.

15 25. The housing of claim 24, wherein each lowpass filter card and each line termination card has four channels, and wherein said plurality of twisted copper pairs is equal to forty-eight.

20 26. The shelf of claim 3, wherein said plurality of said lowpass filter cards is equal to twelve lowpass filter cards and wherein said plurality of line

termination cards is equal to twelve line termination cards.

25 27. The shelf of claim 26, wherein each lowpass filter card and each line termination card has four channels, and wherein said plurality of twisted copper pairs is equal to forty-eight.

28. The shelf of claim 1, wherein said narrowband network provides a plain old telephone service (POTS).

29. The shelf of claim 28, wherein said connection to said broadband network is to an asynchronous transfer mode network.

5 30. The housing of claim 2, wherein said narrowband network is for providing a plain old telephone service (POTS).

31. The housing of claim 31, wherein said connection to said broadband network is to an asynchronous transfer mode network.

10 32. The shelf of claim 3, wherein said narrowband network is for providing a plain old telephone service (POTS).

15 33. The housing of claim 32, wherein said connection to said broadband network is to an asynchronous transfer mode network.

34. The shelf of claim 1 for mounting in a central office rack among a plurality of shelves.

20 35. The shelf of claim 34, wherein said plurality of lowpass filter cards comprises twelve lowpass filter cards, wherein said plurality of line termination cards comprises twelve line termination cards, and wherein four shelves are mountable in said rack.

25 36. The shelf of claim 35, wherein each lowpass filter card and each line termination card has four channels so that said rack serves up to one hundred and ninety-two twisted copper pairs.

37. The housing of claim 2 for mounting in a central office rack among a plurality of shelves.

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38. The shelf of claim 37, wherein said plurality of lowpass filter cards comprises twelve lowpass filter cards, wherein said plurality of line termination cards comprises twelve line termination cards, and wherein four shelves are mountable in said rack.

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39. The shelf of claim 38, wherein each lowpass filter card and each line termination card has four channels so that said rack serves up to one hundred and ninety-two twisted copper pairs.

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40. The shelf of claim 3 for mounting in a central office rack among a plurality of shelves.

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41. The shelf of claim 40, wherein said plurality of lowpass filter cards comprises twelve lowpass filter cards, wherein said plurality of line termination cards comprises twelve line termination cards, and wherein four shelves are mountable in said rack.

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42. The shelf of claim 41, wherein each lowpass filter card and each line termination card has four channels so that said rack serves up to one hundred and ninety-two twisted copper pairs.

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43. The shelf of claim 1, mountable in a central office rack capable of mounting four shelves, each shelf serving up to forty-eight twisted copper pairs for a total of one hundred and ninety-two twisted copper pairs servable by said rack.

44. The shelf of claim 43, wherein up to three adjacent racks can be interconnected in order to support up to five hundred and seventy-six twisted copper pairs.

5 45. The housing of claim 2, mountable in a central office rack capable of mounting four shelves, each shelf serving up to forty-eight twisted copper pairs for a total of one hundred and ninety-two twisted copper pairs servable by said rack.

10 46. The shelf of claim 45, wherein up to three adjacent racks can be interconnected in order to support up to five hundred and seventy-six twisted copper pairs.

15 47. The shelf of claim 3, mountable in a central office rack capable of mounting four shelves, each shelf serving up to forty-eight twisted copper pairs for a total of one hundred and ninety-two twisted copper pairs servable by said rack.

48. The shelf of claim 47, wherein up to three adjacent racks can be interconnected in order to support up to five hundred and seventy-six twisted copper pairs.

20 49. The shelf of claim 1, wherein said plurality of line termination cards are connected to said at least one network termination card by means of said backplane.

25 50. The shelf of claim 49, wherein each of said twisted copper pairs is connected to a corresponding lowpass filter on one of the plurality of lowpass filter cards and to a corresponding highpass filter on one of the plurality of line termination cards.

51. The housing of claim 2, wherein said plurality of line termination cards are connected to said at least one network termination card by means of said backplane.

5 52. The housing of claim 51, wherein each of said twisted copper pairs is connected to a corresponding lowpass filter on one of the plurality of lowpass filter cards and to a corresponding highpass filter on one of the plurality of line termination cards.

10 53. The shelf of claim 3, wherein said plurality of line termination cards are connected to said at least one network termination card by means of said backplane.

15 54. The shelf of claim 53, wherein each of said twisted copper pairs is connected to a corresponding lowpass filter on one of the plurality of lowpass filter cards and to a corresponding highpass filter on one of the plurality of line termination cards.

20 55. The shelf of claim 1, wherein each of said twisted copper pairs terminates at a node (66) that forms a means for frequency division multiplexing said narrowband and broadband services.

25 56. The shelf of claim 55, wherein said node is connected to a corresponding one of said lowpass filters and a corresponding one of said line termination cards and, in particular, to a highpass filter part of said line termination card.

57. The housing of claim 2, wherein each of said twisted copper pairs terminates at a node (66) that forms a means for frequency division multiplexing said narrowband and broadband services.

5 58. The housing of claim 57, wherein said node is connected to a corresponding one of said lowpass filters and a corresponding one of said line termination cards and, in particular, to a highpass filter part of said line termination card.

10 59. The shelf of claim 3, wherein each of said twisted copper pairs terminates at a node (66) that forms a means for frequency division multiplexing said narrowband and broadband services.

15 60. The shelf of claim 59, wherein said node is connected to a corresponding one of said lowpass filters and a corresponding one of said line termination cards and, in particular, to a highpass filter part of said line termination card.

20 61. The shelf of claim 50, wherein said frequency division multiplexing node joins a plain old telephone service signal occupying baseband at 0-4 KHz and a data signal allocated bandwidth greater than 4 KHz.

25 62. The shelf of claim 61, wherein said bandwidth allocation for data is asymmetrically allocated between spectrum used for upstream data as opposed for spectrum used for downstream data, with spectrum used for downstream data predominating.

25 63. The housing of claim 2, wherein said frequency division multiplexing node joins a plain old telephone service signal occupying baseband at 0-4 KHz and a data signal allocated bandwidth greater than 4 KHz.

64. The housing of claim 63, wherein said bandwidth allocation for data is asymmetrically allocated between

spectrum used for upstream data as opposed for spectrum used for downstream data, with spectrum used for downstream data predominating.

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65. The shelf of claim 3, wherein said frequency division multiplexing node joins a plain old telephone service signal occupying baseband at 0-4 KHz and a data signal allocated bandwidth greater than 4 KHz.

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66. The shelf of claim 65, wherein said bandwidth allocation for data is asymmetrically allocated between spectrum used for upstream data as opposed for spectrum used for downstream data, with spectrum used for downstream data predominating.

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67. The shelf of claim 7, wherein said network element processor is used for terminating and processing switched virtual circuit signaling channels.

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68. The shelf of claim 67, further comprising an alarm collection unit (18), and wherein said network element processor is used for providing an ethernet termination for an alarm collection unit ethernet port.

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69. The housing of claim 8, wherein said network element processor is used for terminating and processing switched virtual circuit signaling channels.

70. The housing of claim 69, further comprising an alarm collection unit (18), and wherein said network element processor is used for providing an ethernet termination for an alarm collection unit ethernet port.

71. The shelf of claim 9, wherein said network element processor is used for terminating and processing switched virtual circuit signaling channels.

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72. The shelf of claim 71, further comprising an alarm collection unit (18), and wherein said network element processor is used for providing an ethernet termination for an alarm collection unit ethernet port.

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73. The shelf of claim 1, used as a hub shelf with one or more remote shelves connected thereto.

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74. The housing of claim 2, used as a remote housing used as a hub shelf with one or more remote shelves connected thereto.

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75. The shelf of claim 3, used as a hub shelf with one or more remote shelves connected thereto.

76. The shelf of claim 73, wherein said one or more remote shelves are connected to said shelf by means of an aggregate line termination card corresponding to a transport mechanism used to interconnect said shelf used as a hub with said remote shelf, and wherein a function of said corresponding lowpass filter is carried out at said remote shelf.

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77. The housing of claim 74, wherein said one or more remote shelves are connected to said shelf by means of an aggregate line termination card corresponding to a transport mechanism used to interconnect said shelf used as a hub with said remote shelf, and wherein a function of said corresponding lowpass filter is carried out at said remote shelf.

5 78. The shelf of claim 75, wherein said one or more remote shelves are connected to said shelf by means of an aggregate line termination card corresponding to a transport mechanism used to interconnect said shelf used as a hub with said remote shelf, and wherein a function of said corresponding lowpass filter is carried out at said remote shelf.

10 79. The shelf of claim 73, wherein each said remote shelf is connected to said shelf used as a hub redundantly.

15 80. The housing of claim 74, wherein each said remote shelf is connected to said shelf used as a hub redundantly.

20 81. The shelf of claim 75, wherein each said remote shelf is connected to said shelf used as a hub redundantly.

25 82. The shelf of claim 79, wherein said remote shelves are connected to said hub redundantly by means of connections to two separate shelves and wherein said hub comprises a rack of shelves.

83. The housing of claim 80, wherein said remote shelves are connected to said hub redundantly by means of connections to two separate shelves and wherein said hub comprises a rack of shelves.

25 84. The shelf of claim 81, wherein said remote shelves are connected to said hub redundantly by means of connections to two separate shelves and wherein said hub comprises a rack of shelves.

5 85. The shelf of claim 73, wherein said shelf accommodates line termination cards for direct connection to subscriber premises and aggregate line termination cards for connection to remote shelves, wherein service
10 classes in both cases are provided for subscribers by separate buffers per service class, each contending for upstream access to said backplane, wherein the service class buffers for aggregate line termination cards have a cell priority equal to a sum of the aggregate cell priorities in each buffer or some percentage thereof, in order that subscriber premises connected to said remote shelves are assigned a fair share of an operating bandwidth of the hub.

15 86. The housing of claim 74, wherein said shelf accommodates line termination cards for direct connection to subscriber premises and aggregate line termination cards for connection to remote shelves, wherein service classes in both cases are provided for subscribers by separate buffers per service class, each contending for upstream access to said backplane, wherein the service class buffers for aggregate line termination cards have a cell priority equal to a sum of the aggregate cell priorities in each buffer or some percentage thereof, in order that subscriber premises connected to said remote shelves are assigned a fair share of an operating bandwidth of the hub.

25 87. The shelf of claim 75, wherein said shelf accommodates line termination cards for direct connection to subscriber premises and aggregate line termination cards for connection to remote shelves, wherein service classes in both cases are provided for subscribers by separate buffers per service class, each contending for upstream access to said backplane, wherein the service

5 class buffers for aggregate line termination cards have a cell priority equal to a sum of the aggregate cell priorities in each buffer or some percentage thereof, in order that subscriber premises connected to said remote shelves are assigned a fair share of an operating bandwidth of the hub.

10 88. The shelf of claim 1, wherein said plurality of lowpass filter cards are housed at least in part in a separate splitter shelf for use in cases where separate service providers are responsible for said narrowband and broadband services, or for a digital loop carrier configuration.

15 89. The housing of claim 2, wherein said plurality of lowpass filter cards are housed at least in part in a separate splitter shelf for use in cases where separate service providers are responsible for said narrowband and broadband services, or for a digital loop carrier configuration.

20 90. The shelf of claim 3, wherein said plurality of lowpass filter cards are housed at least in part in a separate splitter shelf for use in cases where separate service providers are responsible for said narrowband and broadband services, or for a digital loop carrier configuration.

25 91. A shelf for use among a plurality of shelves in a rack for use in a telecommunications system for providing both narrowband and broadband services to a plurality of subscriber premises, comprising:

30 a housing for connection to a narrowband network and for connection to a broadband network for connecting said narrowband network and said broadband

network to said plurality of subscriber premises via a corresponding plurality of twisted copper pairs, wherein said housing includes plural sections including:

an upper section (22) for housing in a central portion (24) thereof a plurality of lowpass filter cards with connectors thereon for insertion in a backplane of said housing, and wherein said upper portion (22) of said housing also has end portions (33) reserved for connecting said narrowband network and said plurality of twisted copper pairs; and

a lower section (20) for housing a plurality of line termination cards in a central portion (14) thereof, each with connectors thereon for insertion in said backplane of said housing, and wherein said lower section (20) includes at least one end portion (35) reserved for at least one network termination card for cable connection to said broadband network.